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ENCASED COIL INNERSPRING ASSEMBLY

REFERENCE TO RELATED APPLICATIONS

The present application claims the benefit of Provisional Application Serial No. 60/429,696 filed on November 27, 2002, the contents of which are hereby incorporated by reference in their entirety.

FIELD OF THE INVENTION

The present invention generally relates to coil innerspring assemblies, and more particularly relates to encased coil innerspring assemblies including strips or strings of interconnected pocketed coil springs that are coupled together to form a complete innerspring assembly.

BACKGROUND OF THE INVENTION

A variety of coil innerspring assemblies have been developed within the industry and have been in use for a number of years. Some of these coil innerspring assemblies are comprised of a number of coil springs that are individually encased within an outer spring pocket to form a corresponding number of pocketed coil springs. The spring pockets are typically fabricated by providing a sheet of fabric material that is folded approximately in half with transverse cross seams formed along the height of the spring pocket. The cross seams are spaced apart a distance somewhat greater than the outer diameter of the coil spring to form an appropriately sized spring pocket. A coil spring is inserted into the sleeve pocket and the overlapping edges of the sheet are attached together by a longitudinal seam to close the spring pocket.

In some instances, a series of the pocketed coil springs are interconnected to form an integral/continuous strip or string of pocketed coil springs. One example of a method for forming continuous strips of pocketed coil springs is illustrated and described in U.S. Patent No. 6,398,199 to Barber, the contents of which are hereby incorporated herein by reference. The strings of pocketed coil springs may be coupled together to form a complete coil innerspring assembly.

One example of a method for coupling together strings of pocketed coil springs to form a complete innerspring assembly is illustrated and described in U.S. Patent No. 6,398,199 to Barber. Top and bottom securing sheets or "scrims" may be used as a means for interconnecting strings of pocketed coil springs. The top and bottom scrims are secured to the upper and lower surfaces of the pocketed coil springs by an adhesive or other suitable means of attachment. However, the use of top and bottom scrims tends to increase material costs and the labor costs associated with

securing the scrims to the pocketed coil springs.

Other methods have also been used to couple together individual pocketed coil springs or strings of pocketed coil springs. For example, rings or ties have been used to interconnect adjacent pocketed coil springs. Additionally, stitching or sewing techniques have been used to interconnect adjacent strings of pocketed coil springs. However, the labor costs associated with these methods of interconnection can also be significant.

While advances have been made in the industry, there is a continuing need for improved coil innerspring assemblies, particularly with regard encased coil innerspring assemblies formed of strips or strings of pocketed coil springs that are coupled together to form a complete encased coil innerspring assembly. The present invention meets this need and provides other benefits and advantages in a novel and unobvious manner.

SUMMARY OF THE INVENTION

The present invention relates generally to an innerspring assembly. While the actual nature of the invention covered herein can only be determined with reference to the claims appended hereto, certain forms of the invention that are characteristic of the preferred embodiments disclosed herein are described briefly as follows.

In one form of the invention, an innerspring assembly is provided which includes a plurality of strips of pocketed coil springs extending generally along an axis and including a plurality of axially interconnected spring pockets each having a pocket height. The strips of pocketed coil springs are comprised of overlapping plies of material adjoined together by axially offset cross seams extending generally along the pocket height to define the spring pockets, with each of the springs pockets containing a coil spring. At least two of the strips of pocketed coil springs are coupled together by interconnecting the overlapping plies of material of the least two strips by at least one connecting seam extending along the pocket height and axially offset from the cross seams.

In another form of the invention, an innerspring assembly is provided which includes a plurality of strips of pocketed coil springs extending generally along an axis and including a plurality of axially interconnected spring pockets each having a pocket height. The strips of pocketed coil springs are comprised of overlapping plies of material adjoined together by axially offset cross seams extending generally along the pocket height to define the spring pockets, with each of the springs pockets containing a coil spring. At least three of the strips of pocketed coil springs are coupled together by interconnecting the overlapping plies of material of the at least three strips.

In still another form of the invention, an innerspring assembly is provided which includes a plurality of strips of pocketed coil springs extending generally along an axis and including a plurality of axially interconnected spring pockets each having a pocket height. The strips of pocketed coil springs are comprised of overlapping plies of material adjoined together by axially offset cross seams extending generally along the pocket height to define the spring pockets, with each of the springs pockets containing a coil spring. Overlapping edges of the plies of material are adjoined together by a closing weld seam positioned adjacent an end surface of the pocketed coil springs. At least two of the strips of pocketed coil springs are coupled together by interconnecting the overlapping plies of material of the at least two strips by at least one connecting weld positioned along the pocket height.

In yet another form of the invention, an innerspring assembly is provided which includes a plurality of strips of pocketed coil springs extending generally along an axis and including a plurality of axially interconnected spring pockets each having a pocket height. The strips of pocketed coil springs are comprised of overlapping plies of material adjoined together by axially offset cross seams extending generally along the pocket height to define the spring pockets, with each of the springs pockets containing a coil spring. A first strip of the pocketed coil springs is laterally coupled to a second strip of the pocketed coil springs, with the first and second strips including a first set of laterally adjacent pairs of pocketed coil springs that are attached to one another, and a second set of laterally adjacent pairs of pocketed coil springs that are unattached to one another so as to permit independent movement therebetween.

It is one object of the present invention to provide an improved encased coil innerspring assembly.

Further objects, features, advantages, benefits, and/or further aspects of the present invention will become apparent from the drawings and description set forth herein.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is a side perspective view of an encased coil innerspring assembly according to one form of the present invention.

FIG. 2 is a partial side elevational view of the encased coil innerspring assembly illustrated in FIG. 1.

FIG. 3 is a partial top plan view of the encased coil innerspring assembly illustrated in FIG. 1.

FIG. 4 is a partial end elevational view of the encased coil innerspring assembly illustrated in FIG. 1.

FIG. 5 is a partial side elevational view of an alternative embodiment of the encased coil innerspring assembly illustrated in FIG. 1.

FIG. 6 is a partial top plan view of an alternative embodiment of the encased coil innerspring assembly illustrated in FIG. 1.

FIG. 7 is a side perspective view of the innerspring assembly illustrated in FIG. 1, as integrated into an innerspring mattress according to one embodiment of the present invention.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiments illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is hereby intended, such alterations and further modifications in the illustrated devices, and such further applications of the principles of the invention as illustrated herein being contemplated as would normally occur to one skilled in the art to which the invention relates.

Referring to FIG. 1, shown therein is an encased coil innerspring assembly 100 according to one form of the present invention. The innerspring assembly 100 is generally comprised of a plurality of the pocketed coil springs 102 having a pocketed coil spring height *h*. The innerspring assembly 100 has a length *l* extending generally along a longitudinal axis L and a width *w* extending generally along a transverse axis T. As will be discussed in greater detail below, each of the pocketed coil springs 102 includes an inner coil spring 104 individually encased within an outer spring pocket 106.

In one aspect of the invention, the innerspring assembly 100 includes strips or strings S of interconnected pocketed coil springs 102. In the illustrated embodiment of the invention, the strips S of pocketed coil springs are arranged generally parallel with the longitudinal axis L, extending along the length *l* of the innerspring assembly 100 (i.e., in a head-to-toe direction). However, the strips S of pocketed coil springs may alternatively be arranged generally parallel with the transverse axis T, extending across the width *w* of the innerspring assembly 100 (i.e., in a side-to-side direction). In another aspect of the invention, adjacent strips S of the pocketed coil springs 102 are coupled together to form sections of dual strips S_D and/or triple strips S_T (FIG. 6)

of pocketed coil springs. In a further aspect of the invention, single strips S, dual strip S_D and/or triple strips S_T of the pocketed coil springs 102 are coupled together to form the complete innerspring assembly 100. Further details regarding these aspects and other aspects of the present invention will be discussed below.

In one embodiment of the invention, the coil springs 104 used in association with the innerspring assembly 100 are formed from a metal spring wire such as, for example, high carbon spring wire or Marshall Pack spring wire. In a specific embodiment, the spring wire is automatic coiling and knotting high carbon spring wire. However, other types of spring wire are also contemplated as falling within the scope of the present invention. The diameter of the spring wire may vary depending on factors known to those of skill in the art including, for example, the amount of weight to be supported by the coil springs 104 as well and the desired firmness of the coil spring 104. In a specific embodiment, the diameter of the wire used to form the coil spring 104 is 15 gauge. However, other diameters or gauges of spring wire are also contemplated as falling within the scope of the present invention.

In the illustrated embodiment of the invention, the coil springs 104 are wound in a helical or spiral pattern so as to define a cylindrical-shaped outer profile. However, it should be understood that other shapes and configurations of coil springs are also contemplated for use in association with the present invention. For example, the coil springs 104 may alternatively define a barrel-shaped outer profile, an hourglass-shaped outer profile, or any other spring shape and/or configuration that would occur to one of skill in the art. Further details regarding other configurations of coil springs suitable for use in association with the present invention are illustrated and described in U.S. Patent No. 6,398,199 to Barber and in co-pending U.S. Utility Application entitled "Coil Innerspring Assembly Having Varying Degrees of

Firmness" (Atty. Docket No. 3050-137), the contents of which are hereby incorporated herein by reference.

In one embodiment of the invention, some, or possibly all, of the coil springs 104 may be subjected to a heat tempering process. Heat tempering tends to build memory into the coil springs 104. Heat tempering also tends to provide increased spring force/resistance and/or extended longevity of the action/resiliency of the coil springs 104. In one embodiment of the invention, the heat tempering process includes the step of heating the coil springs 104 to a temperature range between about 500° F (260° C) and about 600° F (316° C). In a specific embodiment, the coil springs 104 are heated to the appropriate temperature by running 50 amperes of current across the length of the spring wire for approximately one second. Further details regarding a heat tempering process suitable for use in association with the present invention are disclosed in U.S. Patent No. 6,398,199 to Barber. However, it should be understood that other methods for heat tempering or heat treating the coil springs 104 are also contemplated as falling with the scope of the present invention.

As discussed above, in one embodiment of the invention, the coil springs 104 are each encased within an outer spring pocket 106 to form a number of individually pocketed coil springs 102. One purpose of encasing the coil springs 104 within the outer spring pockets 106 is to provide a means for interconnecting adjacent coil springs in series to form strips S of pocketed coil springs and/or to interconnect adjacent strips S of pocketed coil springs to form dual strips S_D and/or triple strips S_T of pocketed coil springs which can in turn be interconnected to form the innerspring assembly 100. Another purpose of the outer spring pockets 106 is to prevent adjacent coil springs from interfering with one another during compression and/or expansion.

Yet another purpose of the outer spring pockets 106 is to maintain the coil springs 104 in a pre-compressed or pre-loaded state.

In the illustrated embodiment of the invention, the height *h* of the pocketed coil springs 102 is substantially uniform (e.g., with the top surfaces 102a and the bottom surfaces 102b of the pocketed coil springs 102 arranged substantially even or flush with one another). However, it should be understood that in other embodiments of the invention, the innerspring assembly 100 may be comprised of at least two sets of pocketed coil springs 102 having different pocketed heights so as to provide the innerspring assembly 100 with a varying or non-uniform height (e.g., with the top surfaces 102a and/or the bottom surfaces 102b of the pocketed coil springs 102 arranged at different elevations). In this manner, the innerspring assembly 100 may be configured to exhibit varying degrees of firmness. Further details regarding providing the innerspring assembly 100 with varying degrees of firmness are disclosed in co-pending U.S. Utility Application entitled "Coil Innerspring Assembly Having Varying Degrees of Firmness" (Atty. Docket No. 3050-137), the contents of which having been incorporated herein by reference.

In one embodiment of the invention, the outer spring pockets 106 are formed from a fabric material that allows the fabric to be joined or welded together by heat and/or pressure, such as, for example, in a sonic or ultrasonic welding procedure or another type of thermal welding procedure. In another embodiment of the invention, the fabric material is comprised of a non-woven material. In a specific embodiment, the outer spring pockets 106 are formed from a non-woven, thermoplastic fiber material, such as, for example, a non-woven polymer-based material, a non-woven polypropylene material, a non-woven polyester material, or any other non-woven fabric material that would occur to one of skill in the art. It should be understood,

however, that the outer spring pockets 106 may be formed from other materials, including woven materials and/or non polymer-based materials. For example, the spring pockets 106 may be formed from a wide variety of textile fabrics or other types of sheet materials known to those of skill in the art. Textile fabric materials are particularly well suited for applications involving stitching, stapling, or other similar methods of interconnecting textile fabric materials.

Referring collectively to FIGS. 1-4, according to one aspect of the invention, the innerspring assembly 100 is comprised of a plurality of integral/continuous strips or strings S of pocketed coil springs 102 that are interconnected to form dual strips S_D and/or triple strips S_T of pocketed coil springs 102, which are in turn interconnected to form a complete innerspring assembly 100.

In the illustrated embodiment of the invention, the outer spring pockets 106 are formed by folding a sheet of fabric material in half to provide a two-ply sheet. As illustrated in FIG. 2, a horizontally-extending longitudinal closing seam 110 and a number of vertically-extending transverse cross seams 112 are formed at predetermined locations along the two-ply sheet to create the spring pockets 106. Each spring pocket 106 is sized and configured to accept an individual coil spring 104 to thereby form a strip S of pocketed coil springs 102. As will be discussed in greater detail below, two or more of the strips S of the pocketed coil springs may be interconnected by a vertically-extending transverse connecting seam 114 to form dual strips S_D and/or triple strips S_T of pocketed coil springs.

In one embodiment of the invention, the transverse cross seams 112 are initially formed along the two-ply sheet to adjoin the overlapping plies of material at predetermined locations. The cross seams 112 are offset from one another at an appropriate distance to form individual springs pockets 106 that are positioned so as

to correspond with the final assembled position of the pocketed coil springs 102 within the strip S. Coil springs 104 are then inserted into the individual spring pockets 106 (through the upper openings) and the overlapping edges of the two-ply sheet are adjoined together by the longitudinal closing seam 110 to retain the coil springs 104 within the spring pockets 106, thereby forming a strip S of interconnected pocketed coil springs 102.

In another embodiment of the invention, a sheet of fabric material may be folded in half with the overlapping edges of the two-ply sheet adjoined together by the longitudinal closing seam 110 to form an elongate sleeve. Coil springs 104 are then be inserted into the elongate sleeve (through one of the side openings in the sleeve) and transverse cross seams 112 are formed along the two-ply sheet to adjoin the overlapping plies of material at the appropriate locations to create the individual spring pockets 106, thereby forming a strip S of interconnected pocketed coil springs 102. In yet another embodiment of the invention, a sheet of fabric material may be wrapped or folded about a row of the coil springs 104 prior to forming the longitudinal closing seam 110 and/or the transverse cross seams 112.

In one embodiment of the invention, the coil springs 104 may be pre-loaded to a compressed state prior to being encased within the outer sleeve pockets 106. As disclosed in U.S. Patent No. 6,398,199 to Barber and co-pending U.S. Utility Application entitled "Coil Innerspring Assembly Having Varying Degrees of Firmness" (Atty. Docket No. 3050-137), pre-loading the coil springs 104 to a compressed state has the effect of providing a relatively greater degree of firmness to the pocketed coil springs 102.

As should be appreciated, increasing the firmness of the pocketed coil spring 102 provides increased resistance to loading, which in turn provides a greater degree

of support to the innerspring assembly 100. As should also be appreciated, the innerspring assembly 100 may include at least two sets of pocketed coil springs 102, with each set being pre-loading or pre-compressed by different amounts to provide the innerspring assembly 100 with varying degrees of firmness. In a specific embodiment of the invention, each set of the pocketed coil springs 102 may be formed from coil springs 104 having the same initial, uncompressed height and which are subsequently pre-loaded to a compressed state to define different pocketed coil spring heights. In another specific embodiment, each set of the pocketed coil springs 102 may be formed from coil springs 104 having different initial, uncompressed heights and which are subsequently pre-loaded to a compressed state to define substantially uniform pocketed coil spring heights.

In one aspect of the invention, the closing seam 110 is comprised of a horizontal weld seam 120. In the illustrated embodiment, the weld seam 120 is formed by a number of individual, discrete weld segments or stitches 122. However, it should be understood that the weld seam 120 may alternatively be formed as a substantially continuous weld seam. In a specific embodiment of the invention, the weld seam 120 may be formed, for example, by ultrasonic welding. The technique of ultrasonic welding is known in the art and therefore need not be discussed in detail herein. It should be understood, however, that other welding techniques are also contemplated, including, for example, contact heating, high frequency electrostatic welding, other types of thermal welding or any other welding technique known to those of skill in the art. It should also be understood that other methods of forming the closing seams 110 are also contemplated, including, for example, stitching, stapling or other methods of seaming known to those of skill in the art.

In another aspect of the invention, the transverse cross seams 112 are each comprised of a pair of vertical weld seams 130a, 130b that are arranged side-by-side in a substantially parallel arrangement and separated by a distance *d*. The distance *d* is sized to allow for the separation or division of an adjacent pair of the pocketed coil springs 102 between the vertical weld seams 130a, 130b. As should be appreciated, the inclusion of a pair of vertical weld seams 130a, 130b between the pocketed coil spring 102 allows for subsequent cutting of the strip S to a select length without having to sacrifice or compromise one of the separated pocketed coil springs 102.

More specifically, the strip S of the pocketed coil springs 102 may by divided along a cut line C disposed between the transverse weld seams 130a, 130b (FIG. 2). Notably, if a single transverse weld seam were used, one of the pocketed coil springs 102 adjacent the cut line C would be deprived of a transverse weld seam, thereby requiring that the opened pocketed coil springs 102 be discarded or that an additional transverse weld seam be formed to close the opened pocketed coil springs 102. Additionally, the inclusion of a pair of transverse weld seams 130a, 130b on each side of the pocketed coil springs 102 provides the outer spring pockets 106 and the strips S of pocketed coil spring with an added degree of strength and integrity. However, it should be understood that in another embodiment of the invention, the transverse cross seam 112 may be comprised of a single vertical weld seam positioned between and separating each of the pocketed coil springs 102. It should be appreciated that the strips S of the pocketed coil spring 102 may be cut along the cut line C via a number of devices or methods, such as, for example, a circular knife, a manual or air-actuated knife, a manual or air-actuated scissors, or any other device or method for cutting known to those of skill in the art. It should also be appreciated that the strips S of

pocketed coil springs 102 may be cut to a select length either before or after formation of the dual strips S_D of pocketed coil springs.

In the illustrated embodiment of the invention, each of the transverse weld seams 130a, 130b is formed by a number of individual, discrete weld segments 132. However, it should be understood that the transverse weld seams 130a, 130b may alternatively be formed as substantially continuous weld seams. In a specific embodiment of the invention, the weld seams 130a, 130b may be formed, for example, by ultrasonic welding. However, it should be understood that other welding techniques are also contemplated, including, for example, contact heating, high frequency electrostatic welding, other types of thermal welding or any other welding technique known to those of skill in the art. It should also be understood that other methods of forming the transverse cross seams 112 are also contemplated, including, for example, stitching, stapling or other methods of seaming known to those of skill in the art.

As shown in FIG. 1, in one embodiment of the invention, the closing seam 110 extends along the upper end surfaces 102a of the pocketed coil springs 102. More specifically, the closing seam 110 is positioned adjacent the upper edge or corner 102d formed between the upper surface 102a and the side surface 102c. The advantage gained by positioning the closing seam 110 along the upper surfaces 102a of the pocketed coil springs 102, and more specifically adjacent the upper edge or corner 102d, will be discussed in further detail below. It should be understood, however, that in other embodiments of the invention, the closing seam 110 may extend along other portions of the pocketed coil springs 102, including the lower surfaces 102b or the side surfaces 102c.

In the illustrated embodiment of the invention, the closing seam 110 includes axial portions 110a extending generally along the longitudinal axis L (along the length *l*) and lateral portions 110b extending generally along the transverse axis T (across the width w). Accordingly, the closing seam 110 defines a serpentine-type seam pattern winding along the length *l* of the innerspring assembly 100. In this manner, adjacent strips S of the pocketed coil springs 102 may be easily and conveniently coupled together, the details of which will be discussed below.

According to a further aspect of the invention, adjacent strips S of the pocketed coil springs 102 may be coupled together via a variety of methods. As used herein, the term "coupling" is broadly defined to encompass any means for connecting, attaching, affixing, adjoining, linking, or any other means for coupling one element to another element that would occur to one of skill in the art. In one embodiment of the invention, two adjacent strips S of pocketed coil springs are coupled together to form dual strips S_D of pocketed coil springs 102. As illustrated in FIG. 6, it is also contemplated that three adjacent strips S of pocketed coil springs may be coupled together to form triple strips S_T of pocketed coil springs. In still other embodiments of the invention, four of more adjacent strips S of pocketed coil springs may be coupled together to form multiple strips of pocketed coil springs.

In a preferred embodiment of the invention, adjacent strips S of the pocketed coil springs 102 are coupled together by a vertically-extending transverse connecting seam 114 (running along the pocketed height *h*) to form the dual strips S_D and/or triple strips S_T of pocketed coil springs 102. In a specific embodiment of the invention, the connecting seams 114 are each comprised of a pair of vertically-extending transverse weld seams 140a and 140b disposed on respective sides of the cross weld seams 130a, 130b that form the outer springs pockets 106 (i.e., with the

connecting seams 140a, 140b straddling the cross seams 130a, 130b). The transverse weld seams 130a, 130b and 140a, 140b are preferably oriented in a substantially parallel arrangement relative to one another. However, it should be understood that other arrangements and orientations of the transverse weld seams 130a, 130b and 140a, 140b are also contemplated as falling with the scope of the invention.

As illustrated in FIG. 2, in one embodiment of the invention, the overlapping plies of material of adjacent strips S of pocketed coil springs 102 are interconnected via a transverse connecting seam 114 (e.g., weld seams 140a, 140b) formed between every other adjacent pair of pocketed coil springs 102. This particular method for interconnecting the adjacent strips S of pocketed coil springs 102 provides the innerspring assembly 100 with sufficient structural integrity and rigidity while minimizing manufacturing costs (e.g., requiring a minimal number of the connecting weld seams 140a, 140b). In another embodiment of the invention, the overlapping plies of material of adjacent strips S of pocketed coil springs 102 may be interconnected via a transverse connecting seam 114 formed between each of the pocketed coil springs 102. However, it should be appreciated that increasing the number of transverse connecting seams 114 tends to correspondingly increase the costs associated with manufacturing the innerspring assembly 100. In yet another embodiment of the invention, the overlapping plies of material of adjacent strips S of pocketed coil springs 102 may be interconnected via a transverse connecting seam 114 formed between every third adjacent pair of pocketed coil springs 102. However, it should be appreciated that decreasing the number of transverse connecting seams 114 tends to correspondingly decrease the structural integrity or rigidity of the innerspring assembly 100.

The inclusion of a pair of connecting weld seams 140a, 140b to interconnect the overlapping plies of material of adjacent strips S of the pocketed coil springs 102 tends to provide the interconnection location with an added degree of strength and integrity. However, it should be understood that in another embodiment of the invention, the connecting seam 112 may be comprised of a single connecting weld seam positioned on either side of the cross weld seams 130a, 130b. Additionally, as illustrated in FIG. 5, in another embodiment of the invention, an individual connecting weld seam 140 may be positioned intermediate the cross weld seams 130a, 130b to interconnect adjacent strips S of the pocketed coil springs 102 to form the dual strips S_D and/or triple strips S_T of pocketed coil springs 102. As should be appreciated, this alternative arrangement has the advantage of interconnecting adjacent strips S of the pocketed coil springs with a minimum number of connecting weld seams.

In the illustrated embodiment of the invention, each of the transverse connecting weld seams 140a, 140b is formed by a number of individual, discrete weld segments or stitches 142. However, it should be understood that the connecting weld seams 140a, 140b may alternatively be formed as substantially continuous weld seams. In a specific embodiment of the invention, the weld seams 140a, 140b may be formed, for example, by ultrasonic welding. It should be understood, however, that other welding techniques are also contemplated, including, for example, contact heating, high frequency electrostatic welding, other types of thermal welding or any other welding technique known to those of skill in the art. It should also be understood that other methods of interconnecting adjacent strips S of the pocketed coil springs 102 are also contemplated, including, for example, stitching, stapling,

gluing, adhering, taping, wiring, tying, fastening and/or any other method of attachment known to those of skill in the art.

As illustrated in FIG. 2, the transverse connecting weld seams 140a, 140b preferably do not overlap or intersect the transverse cross weld seams 130a, 130b. Instead the cross weld seams 130a, 130b and connecting weld seams 140a, 140b are offset from one another. Additionally, the cross weld seams 130a, 130b and connecting weld seams 140a, 140b preferably stop just short of the closing weld seam 120. One advantage of this arrangement is the avoidance of "re-welding" weld seams (e.g., welding over, through or across existing weld seams). Instead, each of the weld seams 120, 130a, 130b, 140a, 140b are formed along unwelded or "virgin" pocket fabric material.

Notably, it has been found that re-welding tends to result in degraded or inferior material compositions and a corresponding reduction in the strength and integrity of the connection locations in the areas of the re-welds. More specifically, areas of overlapping/intersecting welds or re-welds tend to create hardened and/or brittle weld material compositions, thereby weakening the connection locations in the areas of the overlapping/intersecting welds or re-welds and compromising the strength and integrity of the outer springs pockets 106 and/or the interconnection locations between the strips S, dual strips S_D and/or triple strips S_T of the pocketed coil springs. The present invention eliminates, or at the very least minimizes, overlapping/intersecting welds and/or re-welds to thereby provide stronger, more reliable pocketed coil springs 102 and a more secure and reliable interconnection between adjacent strips S of the pocketed coil springs.

As discussed above, the closing seam 110, and more particularly the closing weld seam 120, is preferably positioned along the upper surfaces 102a of the pocketed

coil springs 102, and more specifically adjacent the upper edge or corner 102d formed between the upper surface 102a and the side surface 102c. Positioning the closing weld seam 120 along the upper surface 102a of the pocketed coil springs avoids intersection with the cross weld seams 130a, 130b and/or the connecting weld seams 140a, 140b, which correspondingly avoids intersecting welds/re-welds to thereby provide a stronger and more reliable innerspring assembly 100.

Moreover, since the closing seam 110 is positioned adjacent the upper edge or corner 102d of the pocketed coil springs 102, following the completion of the welding procedures, the overlapping longitudinal edges of the sheeting material adjacent the closing seam 110 can be folded down over the upper end portion of the side surfaces 102c. In this manner, the closing seam 110 will not interfere with or effect the "feel" of the innerspring assembly 100, as some experts contend would otherwise contribute to an undesirable different feel between opposite sides of the innerspring assembly 100. In other words, some experts would argue that an upstanding closing seam or margin extending directly across the upper surfaces 102a of the pocketed coil springs 102 may be felt or sensed by an occupant lying on the innerspring assembly 100, which would not be the case if the innerspring assembly 100 were flipped over so that the seamless lower surfaces 102b of the pocketed coil springs 102 face an upward direction. The overlapping longitudinal edges of the sheeting material can also be secured to the upper end portion of the side surfaces 102c by a number of different methods including, for example, tack welding, stitching, stapling, gluing, adhering, taping, wiring, tying, fastening and/or any other method of attachment known to those of skill in the art.

In one embodiment of the invention, the spring pockets 106 are preferably formed so as to fit snuggly or tightly about the coil springs 104. A snug fit between

the spring pocket 106 and the coil spring 104 tends to improve the performance and/or spring efficiency of the coil spring 104 by confining the working action or movement of the coil spring 104 in a vertical direction (i.e., straight up and down). It should be appreciated that the snugness or tightness of the spring pockets 106 about the coil springs 104 is determined, at least in part, by the location and configuration of the transverse cross seams 112 and/or the transverse connecting seams 114. Additionally, the relative length of the pocket material associated with the lateral portions 110b of the closing seam 110 also tends to effect the snugness of the spring pockets 106 about the coil springs 104. More specifically, increasing the length of the pocket material associated with the lateral portions 110b tends to provide a looser fit while decreasing such length tends to provide a tighter or snugger fit.

It should also be appreciated that the snugness or tightness of the spring pockets 106 about the coil springs 104 may also be effected by the particular process used to form the transverse connecting weld seams 140a, 140b. In one embodiment of the invention, the connecting weld seams 140a, 140b are formed by positioning a welding head on one side of a coil strand S and a welding anvil on the opposite side of an adjacent coil strand S. As the welding head is displaced toward the welding anvil, the welding head will come in contact with the spring pocket material and will press against the adjacent coil springs 104. As a result, the tension in the spring pocket material is increased as the adjacent coils springs 104 are urged away from the welding head toward the oppositely disposed transverse cross weld seam 130a, 130b. Following formation of the connecting weld seams 140a, 140b, the spring pockets 106 will remain snuggly engaged about the coil springs 104.

According to another aspect of the invention, single strips S, dual strips S_D and/or triple strips S_T of pocketed coil springs 102 may be coupled together in various

combinations to form the complete innerspring assembly 100. Referring specifically to FIGS. 3 and 4, in one embodiment of the invention, the dual strip S_D of pocketed coil springs 102 is attached or adjoined to an adjacent individual strip S, dual strip S_D and/or triple strips S_T at attachment locations 150. In a specific embodiment, the dual strip S_D are attached to an adjacent individual strip S, dual strip S_D and/or triple strips S_T at attachment locations 150 via gluing. However, other methods of attachment are also contemplated as would occur to one of skill in the art, including, for example, taping, stitching, stapling, wiring, tying, fastening and/or any other method of attachment known to those of skill in the art.

In a specific embodiment of the invention, the gluing technique utilizes a hot melt adhesive applied to the side surface 102c of the pocketed coil springs 102 by a hot melt applicator. However, other gluing or adhering techniques are also contemplated as would occur to one of skill in the art. For example, glue may be applied to the side surface 102c of the pocketed coil springs 102 via a brush or roller. Alternatively, a spray adhesive may be applied to the side surface 102c of the pocketed coil springs 102 via a spray applicator.

As shown in FIG. 4, in one embodiment of the invention, the adjacent pairs P_1 of pocketed coil springs 102 are glued together at the waist or mid-portion of the pocket side surfaces 102c. In other words, the glue locations 150 are positioned along a central midline axis M extending along the pocketed coil springs 102. This method of gluing is particularly advantageous if barrel-shaped pocketed coil springs are utilized. However, it should be understood that other glue locations 150 are also contemplated as falling within the scope of the present invention, including glue locations at or near the upper pocket surfaces 102a and/or the lower pocket surfaces 102b. Additionally, it is also contemplated that the adjacent pairs P_1 of pocketed coil

springs 102 may be attached together by a glue line or strip extending along substantially the entire height *h* of the side surface 102c, or by a series of discrete glue beads or strips disposed intermittently along at least a portion of the height *h* of the side surface 102c.

As discussed above, the dual strip S_D of pocketed coil springs 102 is attached to an adjacent single strip S, dual strip S_D and/or a triple strip S_T. In the illustrated embodiment of the invention, every other adjacent pair P_1 of pocketed coil springs 102 is attached together at attachment locations 150, with the intervening pairs P_2 of pocketed coil springs 102 remaining unattached to one another. It should be appreciated that attachment of every other adjacent pair P_1 of pocketed coil springs 102 (as opposed to every adjacent pair) tends to provide independent spring action or movement between the adjacent single strips S, dual strips S_D and/or a triple strips S_T of pocketed coil springs 102. In other words, permitting the unattached pairs P_2 of pocketed coil springs 102 to move or shift relative to one another correspondingly allows the coil springs 104 to be independently compressed and/or expanded, thereby tending to enhance the responsiveness and/or comport of the innerspring assembly 100. It should be understood, however, that in other embodiments of the invention, every adjacent pair, every third adjacent pair, etc., of the pocketed coil springs 102 may be coupled together to form the innerspring assembly 100.

In another embodiment of the invention, a top sheeting member (not shown) and/or a bottom sheeting member (not shown), sometimes referred to as top and bottom scrims, may be used to further secure the single strips S, dual strips S_D and/or triple strips S_T of pocketed coil springs and/or to further stabilize the coil innerspring assembly 100. More specifically, the single strips S, dual strips S_D, and/or triple strips S_T of pocketed coil springs may be interconnected via a top securing sheet or scrim

(not shown) and/or a bottom securing sheet or scrim (not shown) to form the innerspring assembly 100.

The top and bottom scrims may be formed of the same fabric material as the outer spring pockets 106 or may be formed of a material that is softer and/or more stretchable than the spring pocket material, such as, for example, a polypropylene or polyester material. Textile fabrics or other materials known to those of skill in the art may also be used. The top and bottom scrims may be attached to the upper and lower surfaces 102a and 102b, respectively, of the pocketed coil springs 102 such as, for example, by a hot melt adhesive. However, other methods of attachment are also contemplated as would occur to one of skill in the art. It should also be understood that the top and bottom scrims are optional and are not necessarily required to form the innerspring assembly 100. Further details regarding the use of top and bottom scrims are illustrated and described in U.S. Patent No. 6,398,199 to Barber, the contents of which have been incorporated herein by reference.

Referring now to FIG. 7, shown therein is an innerspring mattress assembly 200 according to one form of the present invention. In one embodiment, the innerspring mattress assembly 200 is comprised of the innerspring assembly 100, a sheet of padding material 202a extending along the top of the innerspring assembly 100, a sheet of padding material 202b extending along the bottom of the innerspring assembly 100, and an outer covering 204 extending about the entire innerspring assembly 100. However, other configurations of innerspring mattress assemblies are also contemplated as falling within the scope of the present invention.

The sheets of padding material 202a, 202b may include, for example, sheets of foam, filling material, and/or any other type of mattress padding material that would occur to one of skill in the art. In one embodiment of the invention, the sheets of

padding material 202a, 202b are attached directly to the upper and lower surfaces 102a, 102b, respectively, of the pocketed coil springs 102. If the innerspring assembly 100 includes top and/or bottom scrims (not shown), the sheets of padding material 202a, 202b may be attached to the outer surfaces of the top and bottom scrims, respectively. In one embodiment of the invention, the sheets of padding material 202a, 202b are attached to the pocketed coil springs 102 (or the top and bottom scrims) via an adhesive material, such as, for example, a hot melt adhesive. However, other methods of attachment are also contemplated as would occur to one of skill in the art. It should be appreciated that the sheets of padding material 202a, 202b may include more than one layer of material arranged in a stacked configuration to form multi-layered sheets of padding material 202a, 202b.

The outer covering 204 may include, for example, an upholstery covering or any other type of mattress upholstery material that would occur to one of skill in the art. In one embodiment of the invention, the outer covering 204 is attached to the sheets of padding material 202a, 202b via conventional upholstering techniques. However, other methods of attachment are also contemplated as would occur to one of skill in the art.

It should be understood that the innerspring assembly 100 may include one or more of the elements, structures, features, characteristics or arrangements illustrated and described in co-pending U.S. Utility Application entitled "Coil Innerspring Assembly Having Varying Degrees of Firmness" (Atty. Docket No. 3050-137) to form additional embodiments of the present invention. For example, the innerspring assembly 100 may include at least two sets of pocketed coil springs having different pocketed heights and/or having upper and lower surfaces disposed at different elevations to provide the innerspring assembly 100 with varying degrees of firmness.

Additionally, the innerspring assembly 100 may include at least two sets of pocketed coil springs having different coil configurations, such as, for example, one set having a barrel-shaped outer profile and another set having an hourglass-shaped outer profile. The innerspring assembly 100 may also include at least two sets of pocketed coil springs having different coil diameters.

It should also be understood that the innerspring assembly 100 may include one or more of the elements, structures, features, characteristics or arrangements illustrated and described in U.S. Patent No. 6,398,199 to Barber. For example, the innerspring assembly 100 may include two or more posturized sections or zones exhibiting different degrees of firmness. In a specific example, the innerspring assembly 100 may include three discrete posturized sections or zones extending across the width *w* to accommodate particular loading requirements associated with various regions of the occupant's body (e.g., the head, torso and leg regions) when lying on the innerspring assembly 100 in a prone position. In another example, the innerspring assembly 100 may also include two discrete posturized sections or zones extending along the length *l* to accommodate particular loading requirements associated with two different occupants.

While the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only the preferred embodiments have been shown and described, and that all changes and modifications that come within the spirit of the invention are desired to be protected.